What is claimed is:

1. A process for generating hydrogen by means of the oxidation of fuels that contain chemically bound hydrogen, comprising:

a) introducing a fuel (1) and an oxidation agent (2) into a reactor (3) having a porous material (4') that is embodied in such a way that flame propagation in a direction opposite to that of flow is prevented,

b) reacting the fuel (1) with the oxidation agent through partial oxidization so that hydrogen is obtained in gaseous form.

2. The process of claim 1, wherein the fuel (1) comprises a hydrocarbon.

3. The process of claim 1, wherein the oxidation agent (2) is ambient air.

4. The process of claim 1, wherein the oxidation agent (2) is pure oxygen or ambient air enriched with oxygen.

5. The process of claim 1, wherein step b) produces heat used to preheat at least one of the oxidation agent (2) and the fuel (1).

6. The process of claim 1, wherein step b) is performed at a pressure of approximately 0.3 to 20 bar absolute.

7. The process of claim 1, wherein the fuel (1) is a hydrocarbon or an alcohol.

8. The process of claim 1, wherein step b) produces CO, wherein the CO is reacted in a further step c) to form CO_2.

9. The process of claim 8, wherein steps b) and c) are performed in different zones of the reactor (3), whereby step b) is performed in a zone (3b) and step c) is performed in a zone (3c).

10. The process of claim 9, wherein the zone (3c) comprises a porous material (4'').

11. The process of claim 8, wherein step b) produces heat used to activate the reaction in step c).

12. The process of claim 8, wherein at least one of steam and an oxygen-containing gas is added prior to step c).

13. The process of claim 8, wherein step c) is performed using a catalyst.

14. The process of claim 1, wherein step b) is performed using a catalyst.

15. The process of claim 9, wherein the porous material of at least one of the zone (3b) and the zone (3c) of the reactor (3) is a fixed bed, a foam structure, or an open-celled macroporous structure of ceramic refractory materials.

16. The process of claim 9, wherein the porous material of at least one of the zone (3b) and the zone (3c) of the reactor (3) comprises a structured metal.

17. The process of claim 1, wherein step (b) includes an open-celled microporous material (4) having a pore size that has a Péclet number that is less than the critical Péclet number below which flame propagation does not take place.

18. The process of claim 1, wherein step (b) includes a material (4) having fine holes (4a), wherein the flow velocity in the holes (4a) prevents the flame from propagating in the direction opposite to flow.

19. An apparatus to produce hydrogen by means of the oxidation of fuels that contain chemically bound hydrogen, comprising a reactor (3) that contains a first porous material (4) and a second porous material (4'), and the reactor (3) comprises a tubular reactor that has a central chamber (5) for introducing a fuel and an oxidation agent, said central chamber (5) extending in an axial direction, wherein the reactor (3) is defined in the radially outward direction by a first wall that contains the first porous material (4), and the first wall is delimited radially to the outside by a second wall that contains the second porous material (4').

20. The apparatus of claim 19, wherein the first porous material (4) has a pore size that has a Péclet number that is less than a critical Péclet number below which flame propagation cannot occur.

21. The apparatus of claim 19, wherein the first porous material (4) has fine holes (4a), wherein the flow velocity in the holes (4a) of the first porous material (4), prevents flame propagation in the direction opposing flow.

22. The apparatus of claim 19, further comprising a third wall of a porous material (4'') that extends radially outward at a given distance and is parallel to the second wall.

23. The apparatus of claim 22, wherein the porous material (4'') of the third wall comprises catalytically active structures.

24. The apparatus of claim 19, wherein said apparatus is delimited by an outer wall (6) that extends axially at a given distance from the third wall.

25. The apparatus of claim 24, wherein the outer wall (6) comprises a double tube to contain a coolant.

26. The apparatus of claim 24, wherein a membrane (10) is disposed on a porous substrate (10') between the outer wall (6) and the adjacent inner wall, said membrane being permeable to hydrogen gas, but not permeable to the other products that result in the oxidation.

27. The apparatus of claim 19, wherein a tube (8) is disposed around the first and second wall, said tube coiled around an outer side of the first wall in the form of an extended spiral.

28. The apparatus of claim 19, wherein the first porous material (4) and the second porous material (4') of at least one of the first wall and the second wall comprises a catalytically active structure.

29. An apparatus to generate hydrogen by means of the oxidation of fuels that contain chemically bound hydrogen comprising a reactor (3) that contains a first porous material (4) and a second porous material (4'), wherein the porosity of the first and second porous materials changes in the direction in which a flame develops to produce larger pores, the first and second porous materials are disposed in a first and second zone (3a, 3b), wherein said first and second zones (3a, 3b) are adjacent to each other and seen in the direction of flow, and a third zone (3c) is provided downstream from the second zone (3b) and contains a third porous material (4'').

30. The apparatus of claim 29, wherein an intermediate space (12) into which a pipe extends to introduce at least one of a gas and steam is provided between the second and third zones (3b, 3c).

31. The apparatus of claim 29, wherein the second and third porous materials (4', 4'') of at least one of the second and third zone (3b, 3c) comprises catalytically active structures.

32. The apparatus of claim 29, wherein a heat exchanger (14) is provided to transfer heat produced in the oxidation reaction that occurs in zone (3b) to at least one of the fuel and oxidation agent that is being added.

33. The apparatus of claim 29, wherein said apparatus is delimited by an outer wall (6) that extends axially at a given distance from the third zone (3c).

34. The apparatus of claim 33, wherein the outer wall (6) comprises a double tube for containing a coolant.

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